Volume 1, Number 5 July 16, 1989

Fidonet HAM/PACKET Digest - For up to date HAM/PACKET info
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T A B L E O F C O N T E N T S

Volume 1, Number 5 July 16, 1989

E D I T O R I A L S

In this issue I have included a very nice series of reports about different antenna types. This file was obtained from the Pinelands RBBS system in New Jersey. This is the 5th issue of the Fidonet HAM/PACKET digest, I am still not getting anything in the way of article contributions. I will continue to try and get something together about every two weeks but it would be a lot easier if some of you readers could make an article or bulletin contribution from time to time. Once again, enjoy the

newsletter!

73 de Brian Murrey - Editor KB9BVN

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B U L L E T I N S
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BEAR results - 220Mhz Band

The results of the Chicago-based BEAR Information Service (BIS) survey appears on this BBS weekly. The survey is conducted during check-in periods Wed. evenings starting at 7:30 on the BEAR (Broadcast Employees Amateur Repeater), 145.15 MHz from Schaumburg, IL. These surveys are conducted to both provide information, and to stimulate dialogue among hams, and between users of telephone BBSes. The June 21, 1989, survey results are as follows:

"On June 21, the FCC threw out 700 petitions that had sought reconsideration of its decision to reallocate 40% of the 220 amateur band. Which of the following best describes your reaction to the commission's latest action regarding 220?"

Furious, 20
Upset, 55
Somewhat concerned, 7
Don't really care, 0
Check-in total, 93.

Rather then complaining about the weather/traffic, conduct your own survey with your drive-time cohorts. You'll be surprised how much faster and less stressful your drive may be.

If you have an idea for a survey question, forward it to the N3AIA packet BBS on 145.05, or 145.07 MHz in Schaumburg, IL.; my packet maildrop in Des Plaines, Il. on 144.95 MHz VIA "CAPRA" node; on the SAMSON telephone BBS in Arlington Hghts, IL, (312) 394-0071; or on the BEAR hotline, (312) 827-BEAR. Since these surveys have been taken since mid 1986, your question may have been used already; but if it hasn't, you will receive credit here. (Credit this week goes to Hap, KC9RP.)

Do YOU have a strong opinion about this week's survey? Write down your thoughts; then phone them in to and record them on the BEAR hotline, (312) 827-BEAR, for possible airing ON the biweekly "90-second soundoff," as a guest editorial on the B.I.S and even on the RAIN Dialup Service nationally, (312) 299-INFO.

73, Hap, KC9RP, B.I.S. producer.

R.A.I.N. Dialup Service

The R.A.I.N. Dialup Service (R.D.S) provides programming for both hams and communications devotees. Produced by R.A.I.N., (the Radio Amateur Information Network) Foundation, the R.D.S. updates 1:00 a.m. (CDT) Fridays at (312) 299-INFO from Des Plaines, IL.

The current edition will be on line from June 23-29, 1989, and includes: part 2 of a series about the just-released FCC rewrite of "part 97"--the rules and regs that govern the U.S. Amateur Service, voiced by Fred Maia, W5YI; and A report re: the FCC'S latest actions on the 220 front, from Art Reis, K9XI.--15 minutes of quality ham radio programming that can be broadcast via Amateur Radio as authorized by FCC regulation 97.113-D(2) GIVE THE R.D.S. A TRY!

Additional R.A.I.N. programming can be heard on the HF ham bands: The i.A.R.N., International Amateur Radio Network, airs a 45-minute program 5 times daily simultaneously on 3975 KHz (LSB); 14275, and 28475 KHz (USB) at these UTC times: 1100, 1300, 1700, 2100, and 0000. When the I.A.R.N. is activated on 14.275 during emergencies, the program may be moved down to 14.265 KHz (3975 and 28475 are unaffected.) Often there is a live "net" on 14.275 following the 1300 broadcasts. There are two additional Sunday transmissions: on 3890 KHz (AM) at 2200, and 7290 KHz (AM) at 2300. The IARN program is transmitted by Glenn Baxter, K1MAN, from Belgrade Lakes, ME. (207) 495-2215; FAX: (207) 495-2069; IARN/RAIN COMPUTER BBS, (207) 495-2490.

The GATEWAY RADIO NEWS LETTER is transmitted by Vern Jackson, WA0RCR, from Wentzville, MO. It typically lasts an hour and can be heard on 1860 KHz (AM) on the 160-meter band at these UTC times: Sat.-Thurs. at 2200; Sundays at 1200, and 1900; Tue. at 0930; and Thurs. (combined with a live "net") at 0100. If you know of other HF ham radio programs, let me know, that I may

update this list.

FREE HAM RADIO PROGRAMMING. if you are looking for ham radio programming on cassette for use on a local net or in your radio club, the RP REPORT is now available FREE of charge. Simply send a blank C90 cassette along with an S.A.S.E. and $.45 return postage. There are 4 RP REPORTS per cassette, one cassette per month. Produced by Hap Holly, KC9RP, the RP REPORT is Available from the R.a.i.n. (Radio Amateur Information Network) Foundation, P.O. Box 2565, Des Plaines, IL. 60017.

BEAR Results - Field Day

The results of the Chicago-based BEAR Information Service (BIS) survey appears on this BBS weekly. The survey is conducted during check-in periods Wed. evenings starting at 7:30 on the BEAR (Broadcast Employees Amateur Repeater), 145.15 MHz from Schaumburg, IL. These surveys are conducted to both provide information, and to stimulate dialogue among hams, and between users of telephone BBSes. The July 5, 1989, survey results are as follows:

"Several weeks ago, many of you indicated you would participate in field day this year. Assuming you did, or have in the past, which one of the following most closely reflects your perception of what field day REALLY is?"

1. It's a bonefide test of emergency preparedness; - 21
2. It's mostly a social event, i.e. a toga party; - 17
3. It does not serve either purpose well; - 4
4. Have never participated. - 13

Check-in Total - 66 (Lowest in over two years)

Instead of complaining about the weather/traffic, why not conduct your own survey with your drive-time cohorts. You'll be

surprised how much faster and less stressful your drive will be.

If you have an idea for a survey question, forward it to the N3AIA packet BBS on 145.05, or 145.07 MHz in Schaumburg, IL.; my packet maildrop in Des Plaines, Il. on 144.95 MHz via the "CAPRA" node; on the SAMSON telephone BBS in Arlington Hghts, IL, (312) 394-0071; or on the BEAR hotline, (312) 827-BEAR. Since these surveys have been taken since mid 1986, your question may have been used already; but if it hasn't, you will receive credit here. (Credit this week goes to Hap, KC9RP.)

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73, Hap, KC9RP, B.I.S. producer.

World Wide Packet Radio List Registration

World Wide Packet Radio Listing
Digipeater and Packet Bulletin Board
Registration Form

The following information is needed inorder for Digipeaters and Packet Bulletins can be registered and listed in the World Wide Packet Radio Listing.

CALL SIGN _____ SSID _____ ALIASES _____
Type [ ] Digipeater [ ] PBBS

Activity Code _____ (Up to 4 are allowed) See list below.

City _____ State/Provience _____
Country _____ Map Grid _____ Postal Code _____
Frequency _____ . _____ Mhz

Act Code - A - DIGI - TNC-1 or Clone (Dumb Digipeater)
B - DIGI - TNC-2 or Clone (Dumb Digipeater)
C - DIGI - Layer 3/4 Node (Network Node)
D - DIGI - VC Switch
E - DIGI - TEXNET
F - DIGI - TCP Switch
G - DIGI - TCP Gateway
H - DIGI - KANODE (Without Gateway)
I - DIGI - KANODE (With Gateway)
J - DIGI - 9600 Baud TNC (Backbone Frequency)
K - DIGI - 56 KB TNC (Backbone Frequency)
L - DIGI - Packet Radio Repeater
M - DIGI - 2400 Baud TNC
N - DIGI - 1200/2400 Baud TNC
O - DIGI - Converse Mode
P - DIGI - G8BPQ NetWork BIOS
- DIGI - This is a Backbone Frequency and users are requested not to use it.

1 - PBBS - BBS, Local User access with Mail Forwarding
2 - PBBS - BBS, Forwarding ONLY (No Users)
3 - PBBS - BBS, Local User access with NO Mail Forwding
4 - PBBS - BBS, DX Cluster
5 - MBOX - Personal Mail Box (Not PBBS)

Please let me know of any changes, deletions, additions or verifications to the World Wide Packet Radio Listing. If you send in data please insure that a seperate entry is sent in for each SSID/Frequency. Send them to me - K4NGC @ K4NGC via one of the Packet Radio PBBS mailboxes or upload it to my Land Line BBS at 703-680-5970. Any call signs listed on this list will be purged if the update date exceeds 2 years, therefor verification is necessary. When sending update data please make sure that you include Call Sign, Type Activities, City, State/Provence, Country, and Frequency. Anyone wishing a copy of the World Wide Packet Radio Listings please send me a 5 or 3 inch IBM formatted

disk, disk mailer, and postage. Persons residing outside the United states please send $5.00 American currancy to cover $3.00 postage, disk and mailer. Those sending American currancy

please indicate if you want 3 inch or 5 inch disk DS/DD or DS/HD. All disks must be in IBM Format (MS-DOS).

73's Don Bennett -- K4NGC
15016 Carlsbad Road
Woodbridge, Va 22193 USA
(Home) 703-670-4773
(OPUS BBS) 703-680-5970 Node 1-109/211
(PACKET RADIO) K4NGC @ K4NGC

FCC Issued Call Sign update

The following is a list of most recently issued FCC call signs (July 1).

DIST	GRP"A" Extra	GRP"B" Advanced	GRP"C" Tech/Gen	GRP"D" Novice
0	WU0U	KF0DT	N0KUY	KB0EXN
1	NX1F	KC1PL	N1GSO	KA1UFB
2	WR2F	KE2OE	N2JQR	KB2IEH
3	NV3I	KD3NS	N3HGK	KA3UXS
4	AB4PG	KM4UN	N4WET	KC4LNM
5	AA5MH	KG5VT	N5OTF	KB5KBE
6	AA6OU	KJ6WP	N6VOJ	KC6EQG
7	AA7AY	KF7VB	N7NBM	KB7IGG
8	WT8Z	KF8AE	N8KZQ	KB8HVA
9	WJ9D	KE9QZ	N9IQG	KB9DCM
Guam	KH2K	AH2CE	KH2DW	WH2AMF
Hawaii	**	AH6JU	NH6TV	WH6CEF
Alaska	**	AL7LI	NL7SD	WL7BVI
USVI	NP2E	KP2BQ	NP2DE	WP2AGY
P.R.	**	KP4QE	WP4VX	WP4IKT

** indicates that all 2 x 1 call signs have been assigned in those areas.

RADIO SCOUTING AT THE '89 JAMBOREE Luck Hurder

Amateur Radio operators will showcase the hobby at the 1989 National Boy Scout Jamboree on August 2-8. K2BSA will be on the air from Fort A. P. Hill, Virginia. Stationed near the "Merit Badge Midway," radio amateurs will teach radio skills to the Scouts.

Message handling services will be provided to the expected 34,000 Scouts and leaders at the Jamboree. Most of the traffic will be routed in and out of the Jamboree site via packet radio. Two on site repeaters (144.57/145.17 and 223.00/224.60 MHz) will be set up and monitored by the K2BSA staff.

K2BSA will be active for the entire Jamboree period on all bands and modes, and a special QSL card will be available. Although traffic handling will take priority, you may listen for K2BSA on the following frequencies (in MHz): CW: 3.590, 7.030, 14.070, 21.140, 28.190, and SSB: 3.940, 7.290, 14.290, 28.350 and 28.990.

A staff of 40 licensed hams includes coordinator Lary Eichel (K2NA), traffic handling station supervisor Bob Johnson (K3RC), Radio Merit Badge instruction and kit building post leader Bill Free (W3FTG), logistics and support team chief Mike Brown (WB2JWD), BSA HQ Liaison Ray Moyer (WD8JKV) and ARRL Liaison Rus Healy (NJ2L).

Radio scouting brings Amateur Radio to America's youth and

scouting provides tomorrow's leaders in business, industry and government. As the Jamboree slogan so aptly states: "The Adventure begins ... with America's Youth!"

ARRL Notes

1990 ARRL NET DIRECTORY REGISTRATION

September 1, 1989, is the registration deadline for the 1990 ARRL Net Directory. If you are a Net Manager please check your 1989 Net Directory. If your net information is correct you do not need to resubmit a registration form. If your net is not listed, or is listed incorrectly, please complete a net registration card (FSD-85) located on the last page of the Net Directory. The registration card is also available from the Field Services Department of ARRL Hq.

ARRL EXECUTIVE COMMITTEE MEETS

The Executive Committee of the American Radio Relay League met on June 24 in St. Louis. Among EC actions were:

- A request for the Legal Strategy Committee to review the text of H.R. 911, a bill to encourage states to provide protection from liability to volunteers.

- A vote to support amendment of the Communications Act of 1934 to make multilateral, as well as bilateral, agreements a basis for the issuance of reciprocal operating permits to aliens. It then voted to oppose amendment of Section 4(f)(4)(J) of the Communications Act of 1934 to eliminate the requirement that individuals and organizations receiving reimbursement from examinees maintain records and certify annually to the Commission that all costs for which reimbursement was obtained were necessarily and prudently incurred.

- The adoption of a statement of policy limiting access to the National Repeater Data Base maintained at Hq.

The Executive Committee also reviewed the status of a number of ongoing FCC, international and organizational matters. The full text of the Minutes will appear in August QST.

The next meeting of the Executive Committee is tentatively scheduled for the weekend of October 21-22.

INVOLVED IN NDMS?

More and more Amateur Radio operators are becoming involved with the National Disaster Medical System (NDMS). To determine how many areas have Amateur Radio participation with NDMS, Bob Josuweit, WA3PZO, Eastern Pennsylvania NDMS Liaison would like the following information from NDMS participants: NDMS area served; Amateur Radio point of contact; types of communication provided (administrative, patient tracking, other); agencies served during NDMS activation; number of hospitals served; number of years active with NDMS; samples of patient tracking information; forms used for patient tracking; special modes used

for NDMS drills (including ATV, satellite, or packet).

If packet is being used, are you using any special software developed for NDMS? Also, have you entered into or developed any formalized plan for Amateur Radio usage during NDMS activation?

Please send comments to: Bob Josuweit, WA3PZO, Eastern Pennsylvania NDMS Liaison, 9 Derwen Drive, Havertown, PA 19083.

ARRL COMPUTER NETWORKING CONFERENCE

The 8th ARRL Computer Networking Conference will be held in Colorado Springs, Colorado, at the Air Force Academy in the Fairchild Hall conference area on Saturday, October 7th. This year's hosts are: Tucson Amateur Packet Radio (TAPR), Academy Amateur Radio Club, USAFA Cadet Radio Club, Rocky Mountain Packet Radio Association (RMPRA) and the American Radio Relay League (ARRL). Call for Papers: If you plan on presenting a paper, please contact Lori Weinberg, at ARRL Hq for an author's package. Deadline for receipt of camera ready papers is August 28, 1989. Registration for the conference is $20.00. Send your $20 registration fee (make checks payable to Andy Freeborn), along with your name, call, address and telephone number to: Andy Freeborn, N0CCZ, President TAPR, 5222 Borrego Drive, Colorado Springs, CO 80918

AMATEUR RADIO NEWSLETTER CONTEST

The Amateur Radio News Service (ARNS) is conducting its annual publication contest, aimed at identifying and recognizing superior performance in Amateur Radio journalism.

The contest is open to all Amateur Radio club publications. Membership in ARNS is not required. Deadline for entries in the 1989 contest is August 31. Submit one copy of any issue of your newsletter published during the period July 1988-June 1989 to Amateur Radio News Service, 11 S. LaSalle St., Suite 2100, Chicago, IL 60603.

HAM RADIO: TAKING IT TO THE PEOPLE

The first annual Amateur Radio Public Awareness Day will be held September 16. To make the general public more aware of the existence, purposes and benefits of Amateur Radio, clubs and individuals will set up and operate public displays across the nation in schools, libraries, town halls, parks, fairs and anywhere else an imaginative club can think of! Start planning your club's public exhibit now!

League HQ can help. For tips on setting up your exhibit, check

out the ARRL Special Events Communications Manual, available

from ARRL HQ for $5.00. (See p 176 of July QST for shipping costs.) Upon request, HQ will also provide you with promotional brochures for distribution to the public at your booth.

QUESTION POOL COMMITTEE ADOPTS EXAM POLICY FOR PART 97 CHANGES

On July 7, 1989, Volunteer Examiner Coordinators (VEC's) representing 97% of all Amateur Radio testing met at their fifth annual conference in Gettysburg, Pennsylvania. The VEC Question Pool Committee (QPC), a standing committee of the VEC Conference, met to discuss the impact of the new Part 97 rules on the existing question pools. The QPC is charged with the responsibility of maintaining these pools. They decided on the following regarding Part 97 changes that apply to Amateur Radio testing.

Written Elements 2 [Novice] and 3(A) [Technician] released on February 1, 1989, will be implemented unchanged on or before November 1, 1989.

The QPC recommends that all Volunteer Examiners (VE's) use discretion in grading those questions where the question or the published answer differs from the rules to be implemented on September 1. VEC's are requested to encourage their VE's to implement these recommendations.

The Committee will publish "discretion lists" of question numbers for each pool that identify those questions affected by the Part 97 rewrite. VE's may wish to substitute these questions from their examinations or, if used, accept an alternate answer which is in accordance with the new Part 97.

Following the publication of a discretion list, the QPC will release a supplement to each existing question pool to bring the pool into conformity with the new rules. The QPC has committed to the production and release of discretionary lists and supplements for all elements by November 1990.

All subsequent question pool revision schedules are suspended until the Sixth Annual VEC Conference on June 15, 1990.

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A R T I C L E S

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Internat'l Amateur Radio Network News 6/89

(for reprint by anyone)

FIVE IARN DELEGATES INVITED TO THE SOVIET UNION

Five IARN delegates from the United States have been officially invited to visit the Soviet Union for two weeks in October, 1989... all expenses paid by the Young Communist League in Moscow. This trip is further implementation of the historic international accords signed between IARN and Soviet officials in Moscow on January 28, 1989. All of this started in December, 1989 after the devastating earthquake in Soviet Armenia. After a full day of offering amateur radio emergency services to the Soviets without much response, the IARN Network Manager met personally with Unites States Senate Majority leader George Mitchell, who agreed to make some high level contacts for us and see what could be done to open up lines of cooperation. Senator Mitchell was able to get a special expedited export license for IARN equipment. A special verbal authority from the Federal Communications Commission for third party traffic between the U.S. and the USSR was also obtained. To this date, we continue to handle official amateur third party traffic between IARN, Soviet officials, and various Soviet expeditions.

The purpose of the visit of our IARN Delegation is to further develop the many projects underway and to lay the groundwork for further cooperation in several areas extending beyond the confines of amateur radio and amateur emergency communications alone. This includes exchanges of students between Saint Louis Community College and other U.S. schools and Soviet schools of higher learning. Covered in the written accords is the $20,000 of IARN equipment loaned to Soviet IARN and our joint IARN/POISK office in Yerevan, Capitol of Soviet Armenia. With this equipment in place, IARN has daily contact with our POISK (search) office. General supervision of this activity is the responsibility of IARN Soviet Director, Victor Goncharsky, UB5WE, of Lvov.

A big feature of the trip will be attending the International Digital Symposium in Minsk where Glenn Baxter, K1MAN, will present a talk entitled "Digital Communications During International Emergency Communications Crisis."

IARN sent the following letter of acceptance to Moscow:

TO: Yuri Bondarev, YCL, Moscow
Vladamir Formin, Poisk Program Coordinator
Victor Goncharsky, UB5WE, IARN Soviet Director

FROM: Glenn Baxter, K1MAN, IARN Manager

We are pleased to receive radio message, RA 43, dated May 25, 1989 and heartily accept your invitation for our I A R N delegation of five to visit the Soviet Union in October, 1989 with air tickets between New York - Moscow - New York and our expenses in the USSR all paid by the YCL (Young Communist League).

You can FAX us any time at 207 495 2069 or access our computer any time at 207 495 2490. A Telex can also be sent addressed to IARN, Belgrade Lakes, Maine 04918 Telephone 207 495 2215.

Our delegation would like to leave New York October 6, 1989 via Aeroflot for Moscow, and return to New York October 19, 1989.

The IARN Delegation has been selected as follows:

Glenn Baxter, K1MAN, (IARN Manager)
Bonnie Baxter (Wife of Glenn Baxter)
Bob Sherin, W4ASX (IARN and Florida Skip Reporter)
Professor Hilliard Goldman, KY0U (IARN Advisor)
Dave Porter, K2BPP (IARN Communications Manager on the Island of Jamaica during Hurricane Gilbert, 1988)

All delegates are non government, private Unites States citizens. We will send passport numbers and more details as soon as we have them available.

We would like to set up meetings in Moscow with various groups such as YCL young people, some of your two and four year technical schools and universities, the Central Radio Club, Radio Sports Federation, Radio Moscow, Radio Magazine, and perhaps some highest government officials such as Mikhail Gorbachev who would be willing to talk with us briefly. We are all very optimistic and enthusiastic about this coming trip. See you soon in Moscow!

Best Regards,
Glenn A. Baxter, P.E., K1MAN
Registered Professional Engineer
I A R N Network Manager

14.313 SERVICE NET GETS UNDERWAY

The new 14.313 Service Net started its regular operations on Monday, June 26, 1989. This net will run every day from now on beginning with the weekly IARN amateur broadcast on 14.313 MHz. (plus 3.975 and 28.475 MHz.) at 0915 UTC followed by a repeat broadcast at 1000 UTC. After the repeat broadcast, at 1045 UTC, the live 14.313 Service Net will begin. This will be followed by the Intercontinental Net and then the Maritime Mobile Net. At 1100 UTC, the normal IARN amateur broadcast schedule begins on 14.275, 3.975 and 28.475 MHz. We feel that this new net and new start up procedure will restore order to operations on

14.313 MHz. which have been severely disrupted recently by the Better Amateur Radio Federation whose leader is Herb Schoenbohm, KV4FZ. Schoenbohm has been invited to serve on the 14.313 Service Net Board of Directors to afford him a proper and democratic voice in the management and affairs of 13.313 MHz.

So far, Schoenbohm has declined to serve on the Board. This brings into question his sincere desire to improve the amateur radio service.

FCC 220 Mhz - Letter from Senate By: Ken Smith

I wrote a letter to Senator Carl Levin concerning the 220 Mhz re-allocation. The following is his response.

Dear Friend:

Recently the American Radio Relay League, on behalf of amateur radio operators such as yourself, brought to my attention problems associated with the reallocation of the 220-222 MHz radio frequency band. The concerns of the ARRL were based on the Federal Communication Commission decision to reallocate the 220-222 MHz band on an exclusive basis to the land mobile service.

Last year Congress passed legislation that required government agencies to take into account "the valuable contributions made by amateur radio operators when considering actions affecting the Amateur Radio Service." In light of this statute and in response to the amateur radio operators' interest in this matter, I informed the FCC Chairman and Commissioners of my strong support for your association's request for reconsideration of the allocation of the 220-222 MHz band. I hope my letter to the FCC (copy enclosed) will help.

I am impressed by and thankful for the significant contributions of the amateur radio operators in our nation and in the State of Michigan. Amateur radio operators represent the true American volunteer spirit, and I applaud the more than 14,000 radio amateurs whose volunteer efforts have assisted the State of Michigan in emergency and disaster relief situations, including the crash in 1987 at Detroit Metropolitan Airport.

I congratulate you and all amateur radio operators on the outstanding service that you provide to Michigan and the nation.

Sincerely,
Senator Carl Levin

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The following is a letter from Senator Carl Levin to the FCC...

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May 25, 1989
Mr. Dennis R. Patrick, Chairman
Federal Communications Commission
1919 M street, N.W., Room 814
Washington, D.C. 20056

Dear Chairman Patrick:

I strongly support the request of the American Relay Radio League (ARRL), on behalf of the more than 450,000 amateur radio operators, for reconsideration by the FCC of the reallocation of

the 220-222 MHz radio frequency band. The amateur radio operators represent the true American volunteer spirit. In Michigan alone we have more than 14,000 radio amateurs whose volunteer efforts have assisted the State of Michigan in emergency and disaster relief situations, including the 1987 Detroit Metropolitan Airport disaster. Last year congress adopted P.L. 100-594, which requires government agencies to take into account "the valuable contributions made by amateur radio operators when considering actions affecting the Amateur Radio Service." The reallocation of the 220-222 MHz band has the potential to displace and impair the service of the amateur radio operators and, therefore, disserve the 1988 legislation.

I urge the Commission to carefully review the concerns of the amateur radio operators over the proposed displacement of their access to the 220-222 MHz band, and to carefully consider all available alternatives when reconsidering this matter. It is particularly ironic that while the President is looking to expand our volunteer sector, the action of the Commission could hurt one of our vital volunteer resources.

Thank you for carefully considering the ARRL concerns and looking into a compromise that will be acceptable to the various intersts involved.

Sincerely,

Carl Levin
Chairman Subcommittee on Oversight of Government Management

How to be a better OP on 2m By:WA1YUA

How about a few words of reminder on better operating practices on 2-Meter FM repeaters:

1) Don't "tail-end" your contact...other folks may need to break in.

2) Don't jabber 'til the timer is about to shut down. Nobody likes a monolog...especially when 9/10ths of your transmission consists of "yeah, very good, uh...hmmm...what was I going to say?....ah, yeah...um..."

3) Give your call every 10 minutes, but don't constantly give the other guy's call...he knows what it is, and he'll have to give it within 10 minutes, anyway.

4) Check the input signal, and, when possible, switch to simplex. Let people who need the repeater use it. Believe it

or not, some local ragchew nets could even been run on simplex!

5) Key your mic before you begin speaking, and release it after you're done. It's hard to understand, "...ation. And I think we should do the best when it comes to com..." (Perhaps you're used to vox on HF, but remember what mode you're running.)

6) Silence is golden...in a roundtable, if you don't know who's turn it is, shut up! Someone WILL pick up the mic.

7) Try to notify the other party/parties in your QSo when you're going QRT; don't just vanish. [See points (1) and (2) above.]

8) Use low power whenever possible. You may be keying up 2 or 3 other machines without knowing it, and that kind of QRM is very annoying.

9) When operating mobile, be aware of whether you are "making the machine". Don't go into a 2-minute oration if you're possibly cutting in and out. Conversely, base operators should give mobile stations signal reports and a bit of extra consideration, since the mobile station has less chance of making solid "full-quieting".

10) If you use a particular repeater or two very often, join the club that maintains the machines! Nothing in life is free, and, while most clubs welcome newcomers and general Amateur use, it's rather selfish to "camp" on one repeater and never offer anything (time, money, etc.) in return.

11) Don't "kerchunk" a repeater with a dead carrier. If you want to see if you can raise the machine, simply say, "WA1YUA testing". Otherwise someone may think you're someone trying to get in but having trouble, or that you're a bootlegger. Besides, if you are testing to see if you can hit the repeater, some other helpful Amateur who's listening might offer you a

useful report on how your signal's getting in.

These are just a few key points that sometimes tend to be forgotten by many of us who have been operating for a while. This should also help new Amateurs get off on the right foot on their local 2-Meter FM repeaters.

If anyone can add to this list, or perhaps jot down some HF, Packet, or other guidleines, please share them with the rest of us on this Echo. Sure, there are always a few Amateurs who "know evrything", but we won't bother trying to teach them anything.

Tnx es 73 de Brian Battles WA1YUA
QTH Colchester, Conn.

Antenna Tutorial - Part 1

Through the courtesy of the Teleconference Radio Net and net manager Rick Whiting, W0TN, we've received a transcript of the June 2nd Teleconference by Joe Reisert, W1JR. Joe spoke on the subject "Antennas and Antenna Systems, Where is the State of the Art Going?"

Joe's talk did an excellent job of covering the whole spectrum of antennas - from HF through UHF - and made heavy use of references in the amateur and professional literature.

For the next couple of weeks, we'll be serializing Joe's talk here in the Ham Radio Tutorials section of the Message Board. The initial series of messages will be left shortly - to be followed by four remaining sections of the talk in the coming weeks.

After the series is presented on the Message Board, it'll also be found archived away in the XA7 database - so that you'll be able to readily refer back to it in the future.

We hope you find the series interesting and useful. It covers a broad range of technical material on a subject of interest to all amateurs. Your discussion of the Joe's text is welcomed!

PART I - Overall Summary and Definitions

Good evening, my fellow amateurs. It is a great pleasure to be here tonight. I feel honored to be selected to speak at this very large and possibly largest ever teleconference. Many thanks go to the Honeywell Amateur Radio Clubs and, in particular, Dave Meldrum, KA1MI, and Rick Whiting, W0TN, for the confidence they have placed in me and also for their helpful hints and suggestions to make this presentation a success.

Tonight my talk will be about "Antennas and Antenna Systems, Where is the State of the Art Going?" I will divide the talk into four separate segments. The first part will deal with general terms and definitions which will set the stage for the rest of the talk. The other three segments will be the "low HF"

(40 through 160 meters), the "middle HF" (10 through 30 meters) and finally VHF/UHF and EME antennas. In most cases I will be talking about the top of the line, state of the art or future antennas and antenna systems.

There is probably no other amateur radio topic that inspires such a vigorous line of conversation as the subject of antennas. Virtually every amateur has some interesting story to tell about his or her favorite antenna or antenna system or one yet to be fully tested. In reality there is no better place to spend you time improving the performance of your station since if the same

antenna is used for transmitting and receiving, every dB of improvement in gain yields a two dB overall station improvement, one dB on transmit and one dB on receive. The old saw still stands... "If you can't hear them you can't work them."

If there is one big complaint that can be leveled against the amateur community it is that they almost never use true gain standards when evaluating antenna performance below 30 MHz. Typical performance is measured in dBs above my last antenna or above a long wire in the trees of how many guys I beat out in the pile up on XZ2XX. Seldom regarded are changes in radio propagation, power of the competition, or operator savvy not to mention good luck in being at the right frequency or timing of the call. Another problem is the sheep following the wrong leader copying an antenna that Joe Blow uses because he works more DX than I do without regard for his physical setup, power or operating ability. The trouble with this kind of approach is that you never really know what you have. You even may have built a real good antenna and replaced it with a poorer one. The situation I've described is not hopeless or beyond even the novice doing antenna tests if you understand your limitations and make a few basic tests.

Typical amateurs can only measure a few antenna parameters such as VSWR and in the case of a rotary beam, front to back ratio. Therefore, the commercial manufacturers make sure that these parameters are good.

Let me be more specific about these parameters and first look at VSWR. All kinds of myths have evolved such as the one that says a 1:1 VSWR is necessary for an antenna to be working properly. This is entirely false. More recently, there has been an

upsurge in the belief since many of the modern solid state rigs will only put out power if the VSWR is below 1.5:1. The lowly antenna tuner is now enjoying a big comeback. We have gone to solid state rigs that don't require tuning but now we have to add an antenna tuner that takes more time to adjust than the old pi-networks we all used to use that would literally load into any VSWR. To further muddy the water, the typical VSWR measuring gear used by amateurs is patterned after the monimatch, a breakthrough in its time but an instrument that is sadly lacking in accuracy when compared to a good directional coupler like the Bird Model 43 thru-line wattmeter and its equivalent toroid directional hybrid VSWR meter. Whenever I hear someone tell me their dipole covers the full 80 meter band with a 3:1 VSWR I just laugh to myself and wonder if they have a lossy feedline, a dummy load or just another incorrect reading VSWR bridge.

Probably the most important antenna parameter is gain. Gain is an antenna property dealing with its ability to radiate power in a desired direction or conversely to receive energy preferably from a desired direction. It is a relative quantity, not measured in watts or ohms, etc. Hence gain must be referenced to something such as a dipole or an isotropic radiator, a

theoretical antenna that radiates power equally well in every direction. HF'ers rarely measure this very important parameter and usually blindly accept the manufacturers claims especially if the front to back looks good. Many persons wrongly feel that if an antenna has good front to back it has good gain. This is not always true and will be discussed later in this teleconference. In many cases the antenna manufacturer can't even measure gain or compares his antenna to the competition and inflates his gain figures by adding a single finagle factor to the competition's claims. Now don't misinterpret my remarks as a slap at the manufacturers. I have noticed a significant improvement in this area in recent years but we still have a long way to go and I hope to give some guidance on this subject later in this teleconference.

VHF'ers realized this problem years ago when they organized a antenna measuring parties. Some of the setups have gotten very exotic but the accuracy can be quite good. The main things that must be taken into consideration are an accurate gain reference antenna, a well illuminated source antenna, accurate measuring

instrumentation and a reality as to what to expect. Two excellent articles on the subject are "Antenna Performance Measurements" by Dick Turrin, W2IMU in November '74 QST pgs 35 thru 41 and "UHF Antenna Ratiometry" by Dick Knadle, K2RIW in February '76 QST pgs 22 thru 25.

The National Bureau of Standards in Boulder, Colorado has done alot of work in gain measurements and NBS Report 5539 entitled "Methods of Accurate Measurement of Antenna Gain" by H. V. Cottony is well worth reading. NBS developed an antenna gain standard which consists of 2 full wave dipoles mounted 1/4 wavelength in front of a 1.6 by 2 wavelength reflector that yields an accurate gain of 9.31 dB over a dipole. This standard was later redesigned for the EIA (Electronic Industries Association) by Richard Yang, a consultant to the Andrew Corporation to a simpler and smaller reference which consists of 2 half wave dipoles space 1/4 wavelength in front of a 1 by 1 wavelength reflector and yields 7.7 dB gain over a dipole. The EIA adopted this smaller reference and incorporated it into EIA Standard 329 entitled "Minimum Standards for Land Mobile Communications Antennas, Part 1, Base and Fixed Station Antennas." This reference antenna standard is the one most commonly used by amateurs and is often referred to incorrectly as the NBS Standard when it is actually the EIA Standard.

While on this subject, the EIA has issued another standard, RS-409 entitled "Minimum Standards for Amateur Radio Antennas, Part 1, Base and Fixed Station Antennas." It uses a half wave dipole for reference and is more apropos to HF antennas. This standard is very specific about the range itself including the reference antenna height, the source antenna height, the minimum distance between antennas and the minimum gain of the antenna under test. It should be noted that the the formula for minimum separation distance between the source and reference antennas is often quoted in the popular literature as 2 D squared/lamda

where D is the largest aperture dimension of the antenna under test. This minimum can introduce an error of up to 1 dB. A better antenna separation standard and the one used by the EIA is 10 D squared/lamda which is accurate to 0.2 dB.

There is a crude but informative method of gain measurement that can be done on rotary beams using simple amateur techniques. It relies on the fact that gain results by redirecting the power

radiated in many directions into a single direction or directions. If the half power bandwidth of the radiated signal can be measured, the gain can be calculated using the formula 41253 divided by the product of the beamwidth in the horizontal and the beamwidth in the vertical plane. Using a locally generated low power signal (such as a local amateur), you first measure the half power bandwidth of your antenna (the points where the signal is down 3 dB from the direct heading). The vertical beamwidth can be estimated to be 5 to 15 percent greater than the horizontal beamwidth. To give a numerical answer, a typical well designed 3 element Yagi has a 60 to 65 degree beamwidth in the horizontal or "E" plane and 70 to 75 degrees in the vertical of "H" plane. Dividing 41253 first by 65 and then by 75 yields a gain of 8.5 or approximately 9.25 dB. This is isotropic gain which is approximately 2.15 dB above the gain of a dipole. Therefore the gain of a typical 3 element Yagi is roughly 7.1 dB over a dipole. By measuring your beamwidth over the frequency bands of interest you can estimate the gain. The wider the beamwidth, the lower the gain and vice cersa. The only restriction to this formula is that all side lobes and read lobes should be at least 15 dB below the main lobe. If not, the gain may be lower than calculated. For further information on this subject, I refer you to "Antennas" by John Kraus.

Always be aware of the beamwidths quoted for a specific antenna. This parameter can usually be accurately measured and tells you if the gain is true gain or specsmanship. Also, some manufacturers list half beamwidth. To convert, just multiply by 2 and proceed. Check the gain reference carefully. Some sources quote isotropic gain which is 2.15 dB above the gain of a dipole.

Transmission Lines and Baluns:

No antenna talk would be complete without at least a few words on transmission lines and baluns. Time does not permit a long segment on this subject. A few general rules apply. Use good low loss non-contaminating types of coax cable such as RG 213. Most RG-8 is poorly shielded, contaminating and deteriorates rapidly meaning your feed line becomes a big attenuator after a few years. The CATV foam coax is low loss, inexpensive and 75 ohms. It will require special connectors and matching transformers (such as synchronous transformers) if you want to go between 50 ohm sources. Make sure no water gets inside as some of the older types of this line will draw water through like a sponge and then cause discontinuities. I prefer Andrew

Corp. Heliax or its equivalent at VHF and UHF. It costs more but has long life and is very low loss making it less costly in the long run. Oper wire lines are great and low loss but require special handling techniques and are particularly vulnerable when humidity or rain is present.

Baluns are a subject that invokes strong arguments. Suffice it is to say that a balun probably doesn't help much on wire antennas and dipoles. On directional antennas it can prevent re-radiation which will reduce front to back ratio. I prefer the balun types that do not require extra wires or windings that interrupt the feedline. My article in September 1978 Ham Radio and the one by Walt Maxwell, W2DU in March 1983 QST discuss this balun type in detail.

Part 1 Summary:

To summarize this portion of the teleconference, we need some accurate antenna gain references. EIA Standard RS 409 may be a step in the right direction. A good directional coupler type of VSWR indicator is a must for the serious amateur. As a side benefit, it may be used to measure output power if the FCC changes the amateur regulations to PEP output power as discussed in the recent Notice of Proposed Rulemaking. Amateurs can determine gain if they make the effort to measure or study the beamwidths and antenna patterns on their antennas and calculate gain as I have described. Hopefully in the not to distant future there will be general agreement on amateur antenna standards so we can objectively compare antennas.

[End of Part 1]

Part 2 - Lower HF Frequencies

In the past few years we have enjoyed some of the greatest radio propagation ever. Now the sun spots are declining and the fervent DX'ers and those looking for a challenge are heading for the lower frequencies. All kinds of new or improved systems are evolving and I will now attempt to cover this frequency range and development.

Simple Antennas:

1. 1/2 wave dipole is hard to beat. It has good directivity, very efficient and the ground reflection in the far field is the only real loss (and that we have no control over!). The biggest problem is broadbanding especially on 80 meters. The open sleeve dipole invented by H. E. King and J. L. Wong (IEEE PGAP, pg 201-204, March 1972) is now being explored for HF. If it can be successfully scaled down from 225-400 MHz., it could improve bandwidth by a 2 to 5 factor.

2. Inverted Vee - radiates equally poor in all directions. Not really my favorite antenna!

3. Verticals: There are many articles on this antenna type by Jerry Sevick, W2FMI, Paul Lee, ex W3JM and now K6TS (?) etc. There are several popular lengths - 1/4, 3/8, 1/2 and 5/8 wavelength. See Ham Radio September 1981 for an interesting article on the 1/2 wavelength vertical by VE2CV. The main problem is ground losses. The ground plane is an exception since it has 3 or 4 resonant radials and hence is very efficient. Typical resistance for the conventional vertical 1/4 monopole is 30 to 36 ohms. Top loading, especially with a top hat is recommended to improve efficiency especially on shortened

verticals. Also bandwidth can be very narrow especially on shortened verticals since they are highly reactive. I am somewhat against verticals for QTH's where ground conductivity is poor or where there are lots of local obstructions. A good vertical has most of its radiation near the current point which is usually the base! Absorbtion by trees, local objects, houses, etc. is very detrimental. Also we have very little control over the far field unless we live on or near a salt marsh or alkaline flat in the prairie.

4. Loops, Quad, Delta, side-fed Delta loop and Bi-Square. Great antennas if you have the space. The most popular seems to be the delta loop apex up fed on the lower corner up part way up the side.

5. Slopers: This is typically a 1/4 or 1/2 wavelength antenna that hangs off a tower and in a semi-vertical fashion and therefore may have some directivity (due to the tower acting as reflector) and a low angle of radiation. I prefer the G5RV antenna (June 1977 Ham Radio Horizons) since it is shorter than a 1/2 wavelength dipole. It consists of 51 feet of wire each side of the center insulator fed with 30 feet of 300 ohm feed

line which then connects directly to a 50 ohm coax line. It does have poor VSWR over most of the band but never infinity. Advantages are multiple band operation (eg. 80/40/20/10) and it acts like a collinear (with gain) on harmonic bands. At my station I use three G5RV antennas as slopers spaced equally around a 97 foot tower and hence get good coverage over most of the world on multiple HF bands with fair directivity.

6. Beverage or traveling wave antenna is especially good for receiving despite its low efficiency. This is true because the outside or ambient noise is very high and hence compensates for the loss. Use a trifilar wound transformer and a low noise high dynamic range preamp to make up for the losses. Keep the height up at say 10 feet so no one walks into antenna and files a law suit against you. This happened locally when a horseback rider was knocked off a horse by a local's beverage antenna! The length should be greater than a wavelength at the operating frequency but 2 wavelengths is probably the maximum recommended length. To keep noise down, use a wire with at least 30% copper and is PVC coated. I have used beverages for transmitting and John Belrose, VE2CV, has recently written an article on same in

a recent QST.

Guys and Guy Wires: They must be tested for resonances especially if they are not broken up with insulators. The difficulty is testing. One test is to monitor VSWR carefully and remove or change a guy. Any changes indicate problems. Likewise, the front to back ratio carefully monitored on a local controlled station can give a feel for the problem. In some rare cases such as sloper arrays, etc., they can actually be part of the array such as working like reflectors, etc.

ARRAYS:

1. Yagi: Very large at HF, especially if full size! Bandwidth can be a big problem. One 75 meter fan (W2HCW) had problems hearing the Russian SSB stations operating on 3640 KHz, despite the fact that he was very strong over there when transmitting in the US phone band at 3800 KHz. When he turned his beam 180 degrees he could hear them but now they couldn't hear him. It turns out that the front to back ratio flipped over below 3700 KHz!

Many stations on 75/80 meters are using wire Yagi beams quite successfully even at low heights (30 to 50 feet). They do work but there is much tuning needed to determine correct lengths, etc. The problem of narrow bandwidth mentioned above must be considered. Loaded Yagi antennas have even narrower bandwidth.

2. W8JK: This antenna has been around a long time and is very successful at HF but it is bi-directional.

3. The ZL Special and KB9CV modern version of same is seldom considered but I think a worthwhile antenna. It is essentially a 2 element log periodic invented over 10 years before the log

periodic! It has excellent gain (like the W8JK), directivity and is uni-directional. The feed system forces the pattern so it does not have the limited bandwidth and pattern reversal problems as severely as the Yagi does. See Ham Radio, May 1976, "Understanding the ZL Special."

4. LPA (log periodic array): It is essentially a wide-band uni-directional antenna. It has a sort of cardiod pattern at its lower frequency end so a reflector is worthwhile. Make the

low frequency cutoff a few % below the lowest frequency of interest to enhance the lower frequencies. The best references are George Smith's articles is 73, Ham Radio and QST. Other good HF articles of interest on the subject are: - "Log Periodic Antenna Design," Ham Radio, Dec. '79 by P. Scholz W6PYK and G. Smith W4AEO. - "Vertical Monopole Log-Periodic Antennas for 40 & 80 Meters," Ham Radio, Sept. '73 by G. Smith. - "Feed System for Log Periodic Antennas," Ham Radio, Oct. '74, G. Smith W4AEO.

5. The bobtail array: This simple array has recently enjoyed a comeback. It consists of three 1/4 wavelength verticals spaced 1/2 wavelength joined at their tops by a single wire. Usually a high impedance antenna tuner is used at the base of the middle vertical to match the high impedance to coax. This antenna has 3 to 5 dB gain and is bi-directional. Recently articles have appeared in 73 magazine on how to feed the array directly with coax at the top of the array.

6. Vertical Arrays: In the last decade or so, many amateur radio state of the art advances have been made in vertical arrays by the late Jim Lawson, W2PV (QST, March and May 1971), Dana Atchley, W1CF et al (QST April 1976), "Updating Phased-Array Technology," W1CF (QST August 1978) and Richard Fenwick, K5RR and R. Schell, PhD (QST April 1977). They have used computer aided techniques to design optimum 2, 3 and 4 element arrays using triangles, squares and lines of verticals. Their work has considerably improved not only the gain but also the front to back and patterns of arrays.

More recently, Roy Lewellen, W7EL (QST, Aug. 1979 pgs. 42/43) and Forrest Gehrke (Ham Radio, May, June, July 1983 and other articles to follow which will tell all!) have shown how to improve the feed systems of such arrays to guarantee that the mutual coupling between elements will not deteriorate the gain and patterns in the real world. This work and computer aided work in the future will have a big effect on operations in the lower HF region.

7. Other Arrays: Don't forget "V" beams and Rhombics. They can yield high gain. The principle problem is patterns which are not always very good (side lobes, etc.). These types of antennas are particularly good if you have lots of real estate and only are interested in one or two directions. I think the sloping terminated "V" beam is particularly worthwhile.

8. The active antenna array: Last but not least let us explore the active array. This usually consists of a small (0.5 to 1.5 meters) vertical monopole feeding the high input impedance of a low noise high dynamic range FET preamp. Arrays of these are in commercial service and can provide extremely high directivity. I am presently working on one for myself for solving some HF receiving problems. The chief advantages of such a scheme are that it is small and doesn't need an elaborate grounding system. Phasing is easy since the outputs are not reactive and mutual impedance affects are low compared to a conventional full-sized array. Also don't overlook ferrite loaded antennas and loops. A good reference for HF DXing and antennas is ON4UN's book on 80 meter DXing.

Summary: There is lots to be done. Computer aided design will help. We must explore optimum topology for vertical arrays (2, 3 and 4 elements etc.) to find best layout. Maybe we should look at the Mill's Cross! The sloper system used today can probably be improved. The software just emerging in the last few years will greatly help in the design of high performance arrays. Don't overlook the log periodic or the ZL Special. The biggest problem to solve may be the wideband feed system. Only now is the open sleeve dipole by Howard King and J. Wong (IEEE PGAP March 1972) being explored. If it can be successfully scaled from the 225 to 400 MHz spectrum, it could potentially yield a 2 to 5 times bandwidth increase over the present half wave HF dipole!

[End of Part 2]

Part 3 - Upper HF Frequencies:

This is probably the frequency region where most amateurs are really concerned about their antennas and probably where the most $$$ are spent. Here the rotary antenna is very popular and being competitive in the pileups is very important.

Other than the usual ground planes, dipoles and long wires, the most often used antennas in the 10 to 30 meter frequency range are the Yagi and the cubical quad.

First my thoughts on the quad. It may be a fine antenna for some amateurs. It is surely an inexpensive antenna but is difficult to keep in the air. It really has high Q in that it's front to back ratio detunes rapidly versus frequency. I strongly doubt that it has greater than 1 dB gain over a properly designed Yagi (more on this later). The usual way a quad is tuned is to maximize the front to back ratio. This does not necessarily mean maximum gain. I personally feel the quad is popular because its construction is simple and low cost. A quad using aluminum tubing would probably do much better but would obviously be unwieldly. One big plus for the quad, and I may add its original invention was for this reason, is its lower static reception level during rain and snow storms. This is unquestionably true. I've gone the quad route twice. Despite 2 years of work on a 3 element quad, it never could compare with a well designed 3 element Yagi and hence was finally scrapped in favor of the Yagi. Tests at VHF and UHF on scaled quads have never successfully shown the gains claimed except on the loop Yagi which I will discuss later in this teleconference.

In this frequency range, the Yagi is King especially among the DXCC Honor Roll members. This antenna has been around the amateur community since the late 1930's. Many people have used

Yagi antennas but few have really paid any attention to proper element lengths. Recent work on scaling and especially on element tapering have been thoroughly discussed by the late Jim Lawson, W2PV, in a series of articles in Ham Radio from August 1979 thru December 1980. These articles show that on 20 meters the elements may have to be lengthened as much as 12 inches and more to equal the free space length of an equivalent untapered element. The results of not performing this extension are lower gain and poorer pattern than expected!

This same series of articles is probably the best collection of references on Yagi design to date. W2PV meticulously explored all details. Of greatest interest are his charts and patterns showing what can be done and how to do it. This is must reading for the serious HF'er.

W2PV also shows how to use computer aided optimization, a technique that is presently beyond those without access to a large computer, but surely something that will be within the realm of home computers in the not too distant future. The principle advantage to computer-aided Yagi design is the ability

to optimize gain, front-to-back ratio or side lobes. One big problem is bandwidth, typically 250 to 300 KHz. maximum at 20 meters. This is true because of the feed systems we amateurs use and the cutoff of the first director causing the pattern to break up at the top of the band. As a word to the wise, design your Yagi antenna on the high side of your favorite operating frequency since this type of antenna cuts off rapidly above the design center but drops performance slowly as the frequency is decreased.

All things being equal and optimum, the boom length, not the number of elements, is the important parameter when determining the gain of a Yagi antenna. A larger number of elements than required insures a good pattern over a wider bandwidth but more elements can also be a negative since there are more things to go wrong both electrically and mechanically! Maximum gain on a one wavelength boom is about 10 dBd! Compare this with the high gains you hear amateurs bragging about on the HF bands.

Another interesting phenomenon on Yagi's is the improved pattern at certain boom lengths. This was first discovered by Peter Viezbicke and reported in NBS Technical Note #688 and later

confirmed by W2PV. The NBS data showed slightly higher gain at certain boomlengths which is probably due to some pattern cleanup. Suffice it to say that for best pattern and gain, the boomlength of a Yagi antenna should be an odd number of quarter wavelengths (eg .25, .75, 1.25, etc.) long. (The only known exception is the famous W2PV 0.575 wavelength boom published in the Yankee Clipper Contest Club Bulletin. However, this design is asymmetrical about the axis and uses very close reflector spacings and is believed to be a special case). We will discuss the NBS Technical Note in depth in the VHF/UHF portion of this talk because the antennas in that report are mostly longer than the typical designs used on HF.

Boom resonances can be a problem especially at HF and where mono-band Yagi's are often stacked Christmas tree fashion for multiband operation. Again, computer optimization has shown that these effects are real. Gain and front-to-back ratio can be significantly decreased when one Yagi is placed close to another one even though they are on different frequency bands. Computer techniques have been used to reduce these effects by re-tweaking the element lengths to offset the detuning effect but even then the results show bandwidth may be decreased by up to 50% of the original design. Some amateurs have used insulated boom mounting clamps in an attempt to offset this effect. Another technique but an ungamely one is to rotate the offending antennas at right angles to the lower antenna. If you place one antenna in close proximity (1 to 2 meters at HF) to another, check the VSWR carefully before and after the change. If the pattern or the VSWR shifts or changes, it is a possible sign of an interaction problem.

Let's not forget the log periodic array! "The Log-Periodic

Dipole Array" by Peter Rhodes, K4EWG, QST, Nov. '73, "The Log-Yag Array" by K4EWG and J. Painter, W4BPP, QST, Dec. '76 and "The Log-Periodic V Array" by K4EWG, QST, Oct. '79 articles are must reading. The addition of the new WARC bands in the future will make log-periodic antennas much more practical. Their main andvantage is good gain, VSWR and pattern over a very wide frequency range rather than the usual narrow bandwidth of the conventional Yagi antenna. One amateur antenna manufacturer presently employs a log-periodic feed system to some of their antennas to increase bandwidth. The log-periodic structure

forces current and therefore pattern by its unique feed system and I think we will see more antennas of this design in the not to distant future.

Summary: We've come a long way in the HF region. There will be a swing towards wider bandwidth and perhaps LPA's will find their way into the amateurs bag of tricks as more spectrum and bands become available (eg. 18 and 24 MHz.). We are getting more discriminating and will demand good patterns and gain at the same time! In the future I see the use of computer aided design to improve patterns and gain as well as bandwidth. Wider bandwidth feed systems are needed. The LPA is one example, the use of the open sleeve dipole is another. Amateurs have notoriously ignored the feed systems and consistently used narrow band feed systems. We must develop wider feed systems and consistently used narrow band feed systems. We must develop wider bandwidth feed systems in the future.

(End of Part 3)

Part 4 - VHF and UHF Antennas:

The spectrum above 50 MHz has special significance to the development of antennas and antenna arrays. This is the frequency range where you can build a really high gain antenna without owning a large piece of real estate. It is also the region where antennas can be tested easily in preparation for scaling them to the HF region. At the upper end of our frequency spectrum the antennas are more aking to optics. I'll divide this segment of the spectrum into two parts, the VHF and UHF regions.

The two major types of antennas used in the VHF spectrum (50 to 225 MHz) are the collinear array and the Yagi structure. The collinear array usually consists of a group of 1/2 wavelength dipoles in front of a screen or set of half wave reflectors. In the later case, it technically could be called an array of two element Yagis. The unique thing about the collinear is the simplicity of the feed system which usually is an open wire line. The collinear is usually quite broadband, unlike most high gain antennas, and efficiency and gain can be quite high. The extended expanded collinear is a stretched out version that has less elements and was described in an article I wrote in Dec. '74 QST. Both the conventional and the extended expanded collinears were widely used in the days before good Yagi designs were available and are still in use by some 144 and 432 EME operators. This type of antenna has two main drawbacks: 1. It is large and hence it can be large enough, an expression the late Sam Harris, ex W1FZJ, used to use for antenna that couldn't stay up under adverse weather and 2. Its size usually prevents mounting other antennas on the same mast.

The workhorse in the VHF spectrum is truly the Yagi antenna. The first high gain VHF Yagi designs were published by Carl Greenblum (QST, Aug/Sept. '56), J. Kmosko, W2NLY and H. Johnson, W6QKI (QST, Jan. '56) and Dr. Hermann Ehrenspeck and H. Poehler (IEEE, PGAP, Oct. '59, pp 379-386). Unfortunately, these Yagis weren't always as good as claimed and had only fair cleanliness in the side lobe and front-to-back ratio. In Jan. '72 (QST pg 96 and March pg 101 corrections), Don Hilliard, W0EYE, now W0PW, published his 4.2 wavelength 15 element Yagi based on the unpublished works of Peter Biezbicke at NBS. Don and I urged Pete to publish his work and he finally did so in Dec. '77 in NBS Technical Note #688, now out of print. This publication was the result of extensive studies done by the NBS in the 1950's to develop high gain arrays for ionospheric scatter and included models with boomlengths of 0.4 to 4.2

wavelengths plus new information on scaling and boom corrections. In August 1977 "Ham Radio" I published a full length article on the NBS report including all the necessary details to build your own Yagis and sketched several models for 50 thru 432 MHz. There are some errors in the NBS publication which are corrected in my article. Not correct was the gain of the 2 element Yagi which should be approximately 5.0 dBd, not 2.6 as reported by NBS (they must have had some measurement

errors). The NBS Yagis are not the only Yagi designs available but they are easily duplicated and near the maximum gain attainable for the appropriate boom lengths. They have excellent patterns and are easily stacked for additional gain.

One more point in passing. The trigonal reflector system in NBS 688 definitely is no good on the 3.2 wavelength and shorter booms. It actually reduces gain by up to 1.5 dB! By lengthening all three elements in this reflector system, I have been able to recover all the gain but no real gain improvement over a single reflector. I have not tested the trigonal reflector on the 4.2 wavelength designs.

In Feb. 1978 QST, Wayne Overbeck, N6NB, published an antenna he named the Quagi. It is basically a Yagi using a quad driven element and reflector. It is low in cost using a wooden boom and fed directly with coax cable. DL9KR and others have done further optimization on the Quagi and have used arrays of 16 to do 432 MHz EME. This design could still use some optimization in gain and only a limited number of designs are available.

Other versions of the Yagi have also been used including the log- periodic fed Yagi developed by the late Oliver Swan and now manufactured by KLM (See Ham Radio, Jan '76, pg 46). The log periodic antenna discussed earlier in this talk has never found much favor with amateurs since there is no need for the bandwidth and it has less gain than a well designed Yagi. Along these lines, we can now make high gain Yagis with clean patterns using the NBS designs. These antennas seem to stack well in larger arrays yielding the 20 plus dBs required for 144 and 220 MHz EME. One EMEer, Dave Olean, K1WHS, is using an array of 24 of the 2.2 wavelength NBS type Yagis stacked 8 feet apart for EME and he has worked stations all over the world who are only using single Yagis and moderate power.

Most recently, with the help of a large computer, a special program and a local person interested in the design of VHF antennas, we were able to develop a very unique Yagi, an 8 element one on a 12 foot boom for 144 MHz that had extremely high gain (greater than 11.5 dBd true gain) with excellent pattern (all lobes down 20 dB). It worked so well that I made 8 copies and first tested them on a 144 MHz EME DXpedition to Rhose Island where 25 stations were worked off the Moon in two nights of operation. Computers will undoubtedly be useful in the future as this work continues.

UHF:

The 420 MHz and up area is in a transisition region. Long Yagi antennas can be made with high gain such as the NBS and Guenter Hoch, DL6WU, types. The later designs are an extension of the Greenblum designs mentioned earlier and can be designed up to 20 wavelengths (see VHF Communications, #3 and #4, 1977, and #3, 1982). These designs show an increasing gain of approximately 2.2 dB for every doubling of the boom length which is about the

maximum so far reported. Indeed I built a 9.25 wavelength (21 foot) 432 MHz Yagi using this design material and achieved a verified gain of almost 17 dBd at the 1981 Central States VHF Conference in Sioux Falls, SD.

Long backfire ("A New Method For Obtaining Maximum Gain from Yagi Antennas", IEEE, PGAP, Vol 7, Oct. '59) antennas have been tried by the EMEers but gains have failed to live up to claims. The short backfire ("The Short- Backfire Antenna", H. W. Ehrenspeck, Proc IEEE, Vol 53, Aug '65) has been duplicated by myself and others and gains of approximately 15 dBi have been achieved. Perhaps more work should be done in this area as an array of short backfire antennas has the potential of higher gain without the problems of the surface tolerances on the parabolic reflector.

Loop Yagi: Another popular UHF antenna is the loop Yagi developed in 1974 by Mike Walters, G3JVL (Radio Communications, RSGB, Jan '75 and Sept '78). Although it looks like a quad, it is distinctly different in that it uses wide but thin metal scraps for elements. Mike started out with wires but could never achieve high gains (like discussed earlier on quads). He recons that the wide but thin strap improves bandwidth and hence

gain. The loops are bolted directly to a metallic boom thus solving the mechanical problems of mounting elements at UHF. It is a very practical antenna for 902 MHz and above and has worked well for me on 902, 1296 and 2304 MHz. G3JVL has even designed and tested to specifications a 10 GHz model. The principle designs use 26, 38 and 45 elements. The gain on the 45 element model (which is 16 wavelengths long) is 21 dBi! G3JVL has also published correction factors so that the loop width thickness and boom size can be scaled.

Dishes: There is something esoteric about the parabolic dish antenna. It just has to work but the typical dish only has a 55% efficiency at best. Furthermore, it has a large wind surface. Therefore, it is not too popular except at frequencies where loop Yagis are no longer economical and for EME where it can often be mounted close to the ground. More on this subject later.

High Performance Arrays: I'd now like to turn to the subject of high performance arrays and more specifically EME (Earth-Moon-Earth) antennas. EME affords a unique property, viz. that due to the approximately 2-1/2 seconds it takes a radio wave to traverse the 450,000 mile path to the Moon and back, the EMEer can make improvements to his antenna system and actually hear the difference by listening for his own echos. Furthermore, EME antennas have such high gain (typically greater that 20 dBi) that you can listen to the noise generated by the sun to measure beamwidth, patterns and hence determine actual antenna gain (see "Requirements and Recommendations for 70-cm EME", J. Reisert, W1JR, Ham Radio, June '82) as well as system noise figure.

Large Yagi arrays are becoming increasingly popular especially for EME. WB0TEM has 24 5.75 wavelength 19 element Yagis on 432 while K1WHS has 24 14 element 2.2 wavelength Yagis on 144 MHz. Both stations have big signals and are able to work small (1 or 2 Yagi) stations off the Moon.

However, the really big EME stations use parabolic dishes up to 40 feet in diameter! The advantages of a dish for EME operation are numberous despite the low (55%) efficiency (some commercial antenna manufacturers have claimed up to 80% efficiency but use

cassegranian feed systems that are quite complex). First off, the feed system can be changed to permit multiband EME. Circular polarization is also possible by using dual dipole feeds or the W2IMU multimode horn. Dish type antennas are usually much quieter on reception because of low side lobes and hence are very desireable with the low sky temperatures experienced on 432 MHz and above. On 432 MHz where linear polarization is still predominant, the most efficient dishes are using the EIA symmetrical "E" and "H" plans and works well with a dish with a 0.45 to 0.5 F/ D ratio. VE7BBG has such a feed with a W2IMU horn built into the center and has made cross band (23 to 70 cm) EME QSO's. A single dipole in front of a splasher plate is definitely not recommended due to its unequal "E" and "H" beamwidths! We still have a long way to go to improve efficiency and the offset parabola recently introduced to EMEers by W2IMU from Bell Labs has considerable advantages if the construction can become feasible for amateurs.

Summary: The VHF/UHF frequency region is a good test bed for developing and improving antennas. Recent developments in the Yagi and loop Yagi have greatly advanced the state of the art in VHF/UHF communications. Antenna patterns have improved and hence the noise temperature of the antennas used is now more compatible with the state of the art preamplifiers. The NBS Yagi data now gives everyone interested a recipe for a suitable antenna without guesswork. EME antennas have taken a big leap forward in performance and made EME operation almost commonplace. We still need to do more work in the area of low loss feed systems especially for Yagi arrays.

[End of Part 4]